

Expressive Writing and Posttraumatic Growth: An Internet-Based Pilot Study

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Abstract

This explorative study examines the effects of an internet-based expressive writing intervention on posttraumatic growth. Participants were randomly assigned to either an expressive writing condition ($n = 14$) or a control writing condition ($n = 10$), with participants writing for 15 minutes on three separate occasions spaced 3 days apart. Measures of intrusive and avoidant trauma-related thoughts and posttraumatic growth were administered at baseline, 2 week and 8 week post-intervention follow-up. Results indicated that intrusive thoughts decreased and posttraumatic growth increased from baseline to 8 week follow-up in the expressive writing group. Further analyses of language use within the written essays suggested that greater use of insight words was associated with greater improvements in posttraumatic growth over the course of the study. Findings are discussed in the context of cognitive processing models of expressive writing. Implications for internet-administered expressive writing are also discussed.

Keywords: Posttraumatic growth, expressive writing, disclosure writing, internet-based research, LIWC

Numerous studies have demonstrated that writing about stressful or traumatic life events is associated with improvements in physical and psychological health, relative to emotionally neutral writing. Expressive writing has been related to improved mood (Páez, Velasco & Gonzalez, 1999), reduced health centre visits (Pennebaker & Francis, 1996), improved immune system functioning (Pennebaker, Kiecolt-Glaser & Glaser, 1988; Petrie et al., 1995), reduced symptoms of depression and anxiety (Hemenover, 2003), and reduced trauma-related intrusion and avoidance symptoms (Klein & Boals, 2001), amongst other outcomes. Meta-analyses have also confirmed that expressive writing can improve physical and psychological well-being (Frattaroli, 2006; Smyth, 1998).

Despite the large body of evidence testifying to the success of the expressive writing paradigm in alleviating symptoms of distress and ill health, most disclosure studies have neglected the positive aspects of psychological functioning that reflect more than a reduction in distress but an increase in positive well-being. As such, few studies have explored whether expressive writing can contribute to increased positive changes in outlook or posttraumatic growth. This is somewhat surprising, given that cognitive processing is considered to be one of the main underlying mechanisms of both expressive writing (e.g. Lutgendorf & Antoni, 1999; Pennebaker, 1993) and posttraumatic growth (Tedeschi & Calhoun, 2004).

Posttraumatic growth is a term that is used to refer to the profound positive psychological changes that can be experienced following trauma and that “propel the individual to a higher level of functioning than that which existed prior to the event,” (Linley & Joseph, 2004, p.11). These changes can include increased compassion and improvements in relationships, enhanced views of the self, or shifts in life philosophy and perspectives (Tedeschi & Calhoun, 1996).

The few studies exploring whether emotional writing about past traumas can facilitate posttraumatic growth have had mixed results. Ullrich and Lutgendorf (2002) found that

individuals who wrote about the cognitions and emotions surrounding a stressful or traumatic event demonstrated significant increases in posttraumatic growth compared to individuals in the emotion-only or control groups. Smyth, Hockemeyer and Tulloch (2008) explored the efficacy of expressive writing in patients with posttraumatic stress disorder (PTSD) and demonstrated that expressive writing participants reported improved posttraumatic growth at 3-month follow-up. Gebler and Maercker (2007) also found that individuals in a standard expressive writing condition reported significant increases in posttraumatic growth from baseline to 8-week follow-up.

Whilst these studies provide preliminary evidence to suggest that expressive writing may promote improvements in growth following trauma, each study had methodological limitations that may compromise their ability to generalise to the wider expressive writing literature. These limitations include lack of a control group (Gebler & Maercker, 2007), using journal entries rather than a standard expressive writing design (Ullrich & Lutgendorf, 2002), and having participants complete all three writing sessions on the same day with only a 15 minute interval between sessions (Smyth et al., 2008). In addition, several other studies (e.g. Park & Blumberg, 2002; Rivkin, Gustafson, Weingarten & Chin, 2006; Slavin-Spenny, Cohen, Oberleitner & Lumley, 2011) have found no effect of expressive writing on stress-related growth. Frattaroli's (2006) meta-analysis also demonstrated that there is currently insufficient evidence to conclude that expressive writing can facilitate posttraumatic growth, but that methodological differences may have influenced existing study outcomes.

One methodological difference in particular relates to the measurement of posttraumatic growth. Those studies finding a positive effect of expressive writing used the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) whilst, with the exception of Slavin-Spenny et al. (2011), the studies finding no effect of writing used alternative assessments of growth. These findings suggest that the effects of expressive

writing may be limited to the PTGI. There is evidence to suggest that different measures of growth are differentially associated with other measures (e.g. Linley & Joseph 2005; Linley, Joseph & Loumidis, 2005). As such, it has been suggested that although growth measures assess a broadly similar construct, each may tap into a different aspect of the growth experience (Joseph & Linley, 2008). Joseph and Linley (2008) have therefore recommended combining assessment tools for a more comprehensive assessment of the growth phenomenon. We follow that recommendation in the current study by using both the PTGI and the Psychological Well-Being – Posttraumatic Changes Questionnaire (PWB-PTCQ: Regel & Joseph, 2010) to assess posttraumatic growth.

The present study had two aims. The first was to test the application of the expressive writing paradigm in a format administered via the internet. Recent developments in internet-based research and intervention delivery have contributed to an increase in studies that have conducted expressive writing using Web-based designs (e.g. Possemato, Ouimette & Geller, 2010; Sheese, Brown & Graziano, 2004), although the feasibility of this delivery format has not yet been tested in samples that have been pre-selected for having experienced a traumatic event.

The second aim was to explore the impact of this internet-based expressive writing intervention on posttraumatic growth. We hypothesised that individuals in the expressive writing group would experience a significantly greater increase in posttraumatic growth relative to individuals in the control writing group. In addition, it was hypothesised that particular patterns of word use, as assessed using the Linguistic Inquiry and Word Count (LIWC, Francis & Pennebaker, 1992) text analysis program, would be meaningfully associated with study outcomes. Specifically, it was hypothesised that participants were most likely to benefit from the writing intervention if their essays contained an increasing number of causal (e.g. *because, why, reason*) and insight (e.g. *understand, realise, thought*) words

from the first to the third writing session, since these patterns of word use are presumed to reflect increased cognitive processing. These hypotheses were in line with findings from prior research (e.g. Pennebaker, 1993; Pennebaker, Mayne & Francis, 1997; Rivkin et al., 2006).

Method

Procedure

The study protocol was approved by the Institute of Work, Health and Organisations' Ethics Committee at the University of Nottingham and was conducted in line with the British Psychological Society (BPS) standards for the ethical conduct of research with human subjects. Participants were recruited from a pool of volunteers that had taken part in a previous online questionnaire study about adjustment following traumatic events (see Stockton, Hunt & Joseph, 2011, Study 2) and had responded that they would be willing to take part in further research. All participants that had provided an email address following completion of this prior questionnaire were emailed and invited to take part in the current writing study. Emails were sent on average 1.21 days ($SD = 1.09$) after the participant completed the first questionnaire. Each email contained information about the writing study, the link to the writing study website, and reminded participants of their unique username that they had created when completing the baseline assessment which they would be required to enter in order to access their writing instructions. Interested participants were encouraged to return to the study website as soon as possible to complete the scheduled writing exercises.

Participants were randomly allocated, based on order of presentation to the study, to one of two writing groups: an experimental disclosure group or a control writing group. Writing instructions for each condition and session were replicated from the protocol used by Pennebaker (1997), although minor adjustments were made in line with the design of the

current study.¹ Briefly, participants in the disclosure condition were asked to write continuously for 15 minutes on three separate occasions about the most traumatic or distressing experience of their life with as much emotion and feeling as possible. Participants were free to write about either the same or different experiences at each session. Those assigned to the control writing condition were instructed to write continuously for 15 minutes on three separate occasions about how they spent their time, without reference to their emotions or opinions and being completely objective. All participants were assured of the confidentiality of their writing.

During the baseline assessment, prior to writing and after obtaining informed consent, participants responded to questions concerning demographic information and information about any traumatic life events they had experienced. They also completed the Impact of Event Scale-Revised (IES-R), the Posttraumatic Growth Inventory – Short Form (PTGI-SF), and the PWB-PTCQ. When returning to the study website to complete the writing tasks, participants were given their condition-specific instructions and asked to write continuously in the text box provided for 15 minutes. Following completion of each writing task, participants completed the Essay Evaluation Measure. Each participant was then sent a personalised email which acknowledged receipt of their completed writing, thanked them for their continued participation, notified them of the date for their next writing session, and contained details of sources of emotional support should they require it. On the fourth and seventh day of the study, participants were emailed with the link to the website requesting that they log back on and complete their next writing exercise. Two weeks after completing the third and final writing exercise, participants were emailed with the link to the post-intervention questionnaire site, which contained all measures included at baseline except the

¹ Specifically, the instructions provided by Pennebaker (1997) were for a study where participants wrote for 20 minutes over four consecutive days. As such, references to the timing or number of writing sessions were changed to fit the design of the current study.

questions concerning demographic and event-related information. Participants also completed these measures again 8 weeks after the final writing session. Upon completion of the 8 week follow-up questionnaire, participants were directed to a debriefing page where the nature of the study was explained to them.² Participants were thanked for their continued participation throughout the study and were given the contact details of several emotional support services. Once all study tasks had been completed, participants were emailed a £5 voucher for Amazon.com.

Uptake and Attrition

Of the 188 participants that took part in the initial study (Stockton, Hunt & Joseph, 2011, Study 2), 107 indicated that they would be willing to take part in further research and provided their email address. Email invitations to the writing study were sent to all 107 addresses, but 4 were undelivered due to incorrect addresses or expired accounts. Individuals that provided a valid email address ($n = 103$) did not significantly differ from those that did not ($n = 85$) on any study variables apart from PTGI-SF total: participants that provided an email address scored significantly lower on the PTGI-SF ($M = 18.75$, $SD = 11.11$) than participants that did not provide an email address ($M = 22.73$, $SD = 12.86$), $t = 2.63$, $df = 252$, $p = .009$.

Of the 103 participants receiving the email, 53 participants (51.5%) visited the writing study website and logged in using their usernames (18 control, 35 expressive). T-tests and Chi-square tests revealed that individuals who logged on to the study website ($n = 53$) were not significantly different from those who received the email but did not return to the study website ($n = 50$) on any demographic, event-related or study variables (all p 's $> .12$). Of the

² Participants that withdrew from the study before completing all writing sessions or assessments were also sent an email to debrief them about the goals of the study and to ensure they did not suffer any adverse effects from their participation. The contact details of emotional support services were also provided in the email.

53 remaining participants that returned to the writing study website, 14 did not complete the first writing exercise (1 control, 13 expressive), 5 did not return to complete the second writing exercise (2 control, 3 expressive), 1 control participant did not return to complete the 2 week follow-up questionnaire, and 9 did not return to complete the 8 week follow-up questionnaire (4 control, 5 expressive). Overall, 24 participants completed all stages of the study; 10 control and 14 expressive writing participants. Completers and non-completers did not significantly differ on any demographic characteristics (all $ps > .16$), but independent samples t-tests revealed that participants who completed all stages of the study reported significantly greater intrusive thoughts ($t = -2.70, p = .009$) at baseline than non-completers. Attrition did not significantly differ by writing group ($\chi^2 = .097, df = 1, p = .756$).

Participants

Complete data was available for 24 participants: 1 male and 23 females, ages ranging from 19 to 63 years ($M = 33.18, SD = 12.31$).³ Participants in this sample were predominantly white ($n = 23; 95.8\%$), single ($n = 11; 45.8\%$) or married ($n = 5; 20.8\%$) and educated to at least degree level ($n = 16; 66.7\%$). Events had occurred within 2 months to 31 years previously ($M = 8.82$ years, $SD = 9.81$) and were rated as extremely distressing by 81.8% of participants ($M = 3.73, SD = .63$). At the 8 week follow-up, seven participants (29.2%) reported having experienced a subsequent trauma following completion of the writing exercises. The mean distress rating for these additional events was 3.54 ($SD = .51$) on the 0 to 4 scale.

Measures

Demographic and Event-Related Information

³ The one male participant in this study was randomly allocated to the control writing group. All analyses were repeated with the male participant removed to explore the results in an all-female sample. However, removing this participant's data from the analyses did not alter the results therefore his data was retained in all analyses.

At the baseline assessment, participants provided self-reported demographic information including gender, age, marital/relationship status, ethnicity and education. Information about the traumatic event they had experienced was also collected. Participants were asked to briefly describe the most traumatic event of their life, state when the event had happened, how old they were at the time of the event, and a rating of how distressing they had found their experience ranging from 0 (*not at all distressing*) to 4 (*extremely distressing*). At the 8 week follow-up, participants were asked to indicate whether they had experienced any subsequent traumatic events since completing the writing sessions and if so, were asked to rate how distressing that subsequent trauma had been on the same 0 to 4 rating scale.

Impact of Event Scale-Revised

The IES-R (Weiss & Marmar, 1997) is a 22-item self-report measure of subjective distress after experiencing traumatic event. Respondents rate each item on a 5-point Likert-scale of 0 (*not at all*) to 4 (*extremely*), indicating how distressing each item had been in their life during the past 7 days. The IES-R is one of the most extensively used scales in trauma research and has good psychometric properties (Creamer et al., 2003; Joseph, 2000).

Posttraumatic Growth Inventory – Short Form

The PTGI-SF (Cann et al., 2010) is a 10-item measure of positive changes following adversity. Items were rated on a 6-point Likert scale of 0 (*I did not experience this change*) to 5 (*I experienced this change to a very great degree*), with higher scores indicating greater levels of growth. The PTGI-SF has been shown to have acceptable construct validity and internal consistency reliability (Cann et al., 2010).

Psychological Well-Being Post-Trauma Changes Questionnaire

The PWB-PTCQ (Regel & Joseph, 2010) is a self-report measure designed to assess perceived changes in psychological well-being following traumatic events. It contains 18 items, with 3 items tapping each of the dimensions of self-acceptance, autonomy, purpose in

life, relationships, sense of mastery, and personal growth. Each item is rated on a 5 point Likert scale of 1 (*Much less so now*) to 5 (*Much more so now*), with possible scores ranging from 18 to 90 and higher scores indicating greater increases in psychological well-being. Internal consistency reliability has been shown to be satisfactory (Cronbach's alpha ranged from .87 to .95 for the PWB-PTCQ total and from .60 to .88 for the subscales) and scores showed a moderate level of consistency over 6 months (Joseph et al., under review).

Essay Evaluation

Immediately following each writing session participants completed an essay evaluation measure (Greenberg & Stone, 1992) to assess their subjective evaluation of the extent to which they thought their essay was personal, meaningful and revealing of their emotions. Respondents rated each on a 7-point Likert scale of 0 (*not at all*) to 6 (*a great deal*). This served as a manipulation check to test whether participants adhered to their specific writing instructions.

Writing Content

The Linguistic Inquiry and Word Count program (LIWC 2007; Pennebaker, Booth & Francis, 2007) is a text analysis program that searches text files and examines the occurrence of various types of words that fall into specific categories, as well as calculating statistics such as the total number of words or number of words per sentence. Because the focus of the current study was on potential cognitive processing mechanisms, the specific LIWC categories analysed were causation words (e.g. *because, why, reason*) and insight words (e.g. *understand, realise, knew*). In addition negative emotion words (e.g. *sad, hate, hurt*) and positive emotion words (e.g. *happy, good, love*) were used as a manipulation check to determine whether writing instructions affected essay content. Pennebaker and King (1999) provided evidence for the reliability and validity of written language analysed by LIWC. Each essay was subjected to a computerised spell check before being analysed by LIWC.

Results

Description of Events

Participants in the disclosure group wrote about a range of traumatic events, including childhood sexual abuse ($n = 4$), rape ($n = 3$), sudden or traumatic death of a friend or family member ($n = 2$), and diagnosis of a serious illness or injury ($n = 3$). Eleven participants wrote about the same topic for all three writing sessions, whilst 3 participants wrote about a different event for each writing session. Whether participants wrote about the same topic or switched topics was not significantly associated with any baseline or outcome variables (all p 's $> .231$).

Manipulation Checks

Manipulation checks were conducted to ensure that participants adhered to the specific writing instructions. The results of these analyses are presented in Table 1 and demonstrate that the experimental manipulation was largely successful. First, results for the essay evaluation measure (Greenberg & Stone, 1992) showed that across the three writing sessions, participants in the expressive writing group rated their essays as more personal, more meaningful, and more revealing of their emotions than control group participants. Secondly, results from the LIWC text analyses demonstrated that individuals in the expressive writing group used significantly more negative, but not positive, emotion words in their essays than control group participants. Similarly, expressive writing participants used significantly more insight, but not causation, words than control participants, although by the third writing session the difference in use of causation words became significant, with expressive writing participants using significantly more words signifying causation than control group participants. There were no significant differences in the total number of words used per writing session across the two writing groups.

- *Insert Table 1 about here* -

Between-Group Differences at Baseline

In order to examine whether there were any pre-existing differences in the expressive writing and control group participants prior to the writing intervention, a series of statistical tests were conducted. In terms of demographic characteristics, independent samples t-tests showed that the groups did not differ in terms of age ($t = -1.65, df = 22, p = .113$), time since trauma ($t = .009, df = 22, p = .993$), age at trauma ($t = -1.05, df = 22, p = .303$), or subjective rating of the events stressfulness ($t = -.711, df = 22, p = .485$). Chi square tests demonstrated that the groups did not differ with respect to sex ($\chi^2 = 1.46, df = 1, p = .227$), marital status ($\chi^2 = .362, df = 3, p = .948$), or educational attainment ($\chi^2 = 1.143, df = 3, p = .767$). As such, the expressive writing and control groups can be considered comparable with respect to demographic characteristics.

Analysis of study variables revealed that the expressive writing and control groups did not significantly differ at baseline in terms of IES-R subscale scores or PTGI-SF scores. However, an independent samples t-test demonstrated that control group participants scored significantly higher than expressive writing participants on the PWB-PTCQ at baseline.

Associations Between PTGI-SF and PWB-PTCQ

The PTGI-SF and the PWB-PTCQ were found to be moderately associated at baseline, two weeks, and eight weeks (lowest $r = .65, p < .001$). The association between PTGI-SF and PWB-PTCQ change scores (T3-T1) were also correlated ($r = .67, p < .001$). It would seem warranted therefore to use both measures of growth as separate outcome measures. .

Effects of Writing on Outcome Variable Change Scores

Table 2 displays mean scores and standard deviations for outcome variables over the course of the study as a function of writing condition. Change scores (T3 – T1) were

calculated to analyse the changes in IES-R intrusion, IES-R avoidance, IES-R Hyper-arousal, PTGI-SF and PWB-PTCQ over time as a function of writing condition.⁴ Independent samples *t*-tests revealed that change scores for the IES-R intrusion, IES-R avoidance and IES-R hyper-arousal subscales did not significantly differ between control and disclosure writing groups ($t = .438, p = .667$ for intrusion, $t = -1.139, p = .268$ for avoidance, $t = 1.227, p = .234$ for hyper-arousal), with mean change scores indicating that both groups experienced reductions in intrusive and avoidant thinking and hyper-arousal from baseline to 8 week follow-up. Further analyses using paired *t*-tests revealed that there was a significant reduction in IES-R intrusion for participants in the disclosure writing group only ($t = 3.672, p = .003$).

There was also no significant difference in PTGI-SF change scores between the control and disclosure writing groups ($t = -.065, p = .949$) with both groups experiencing minimal change on this measure over the course of the study. However, PWB-PTCQ change scores significantly differed between control and expressive writing groups, $t = -2.490, p = .022$, with control participants reporting a slight decrease in PWB-PTCQ over the course of the study period ($M = -1.75, SD = 6.27$) and expressive writing participants reporting an increase in PWB-PTCQ from baseline to 8 week follow-up ($M = 5.50, SD = 6.72$).⁵ These analyses indicate that participants in the disclosure group experienced significant reductions

⁴ Several analytic approaches are viable and were considered, but since writing groups differed at baseline with respect to PWB-PTCQ scores, analysis of change scores was regarded as the most appropriate method. Although there is disagreement about the use of change scores rather than covariance analysis, the strategy of calculating pre- to post-intervention change scores has been recommended as a way to reduce the influence of baseline differences between experimental conditions (Oakes & Feldman, 2001). In addition, analysing change scores provides a more direct test of the question of whether the control and experimental condition improved at the same rate, rather than the question tested by ANCOVA of “whether an individual belonging to one group is expected to change more (or less) than an individual belonging to the other group, *given that they have the same baseline response*” (Fitzmaurice, Laird, & Ware, 2004, p. 124, emphasis in original). As such, change scores indicate how much each group improved, deteriorated or stayed constant, and by how much, thus providing an “unbiased estimate of true change” (Rogosa, 1988, p. 180). Other work in this area has also relied on change score analysis (e.g. Lutgendorf & Antoni, 1999; Smyth et al., 1999; Smyth et al, 2008).

⁵ Since the mean scores indicated a small decrease in PWB-PTCQ for the control group and an increase in PWB-PTCQ for the disclosure group, paired *t* tests were conducted and demonstrated that the increase in PWB-PTCQ from baseline to 8 week follow-up was significant for the disclosure group, while the decrease in PWB-PTCQ from baseline to 8 week follow-up was not significant for the control group. Thus, the source of the significant difference in PWB-PTCQ change scores is due to an improvement in the disclosure group, rather than a reduction in the control group.

in the frequency of intrusive cognitions across the course of the study period. Furthermore, disclosure writing participants experienced a significant increase in the extent of posttraumatic growth reported from baseline to 8 week follow-up.

- *Insert Table 2 about here* -

LIWC Language Analysis

Analyses were conducted to explore whether word use patterns across the writing sessions were associated with changes in outcome variables. Correlations between the LIWC dimensions and outcome variable change scores are presented in Table 3. Results demonstrate that LIWC dimensions were not significantly associated with the degree of change in IES-R Intrusion or Hyper-arousal, but that mean use of insight words was positively associated with IES-R Avoidance such that participants who used a greater percentage of insight words in their essays experienced increases in avoidant thinking from baseline to 8 week follow-up. Unexpectedly, the causal change variable was negatively associated with PTGI-SF change scores, such that participants that evidenced an increase in their use of causal words over the course of the writing sessions experienced a reduction in the extent of posttraumatic growth reported over time, whilst a declining use of causal words was associated with improvements in posttraumatic growth from pre- to post-writing. However, this association was not replicated when posttraumatic growth was assessed using the PWB-PTCQ.

The findings displayed in Table 3 also reveal that the mean use of negative emotion words was positively associated with PWB-PTCQ change scores such that participants who used a greater percentage of negative emotion words in their essays experienced increases in posttraumatic growth from baseline to 8 week follow-up. Similarly, the positive association between differential emotion and PWB-PTCQ change scores indicates that a greater use of negative emotion words relative to the use of positive emotion words was associated with

greater improvements in growth from pre- to post-test, whilst using more positive and fewer negative emotion words was related to a decline in the extent of growth reported. Finally, the association between the overall use of insight words and change in PWB-PTCQ was significantly positive, with participants who used a higher proportion of words reflecting insight experiencing greater improvements in growth over the course of the study. Contrary to initial hypotheses, change in the use of insight words over the writing sessions was not significantly associated with changes in any outcome variables.

- *Insert Table 3 about here* -

Discussion

This study is one of the first to use an internet-based design to explore the impact of expressive writing on posttraumatic growth in survivors of traumatic life events. The results show that writing about one's thoughts and feelings can contribute to statistically significant increases in the extent of growth reported from baseline to 8 week follow-up.

Evidence for the mechanisms through which change takes place is provided from the LIWC analyses, which demonstrated that greater use of insight words in the essays was associated with greater increases in posttraumatic growth. Prior research has also shown increased insight words to be predictive of improved health and well-being (e.g. Pennebaker et al., 1997; Ullrich & Lutgendorf, 2002).

Consistent with previous research, results from the current study also demonstrated that expressive writing participants reported a significant reduction in the extent of intrusive trauma-related cognitions experienced.. As such, this study adds to the evidence body by demonstrating that Internet-administered expressive writing can also contribute to a decline in intrusive re-experiencing, although word use assessed using the LIWC was not predictive of reductions in intrusions in this study. Pennebaker (1989) has suggested that written emotional expression reduces intrusions because it enables people to confront trauma-related

thoughts and feelings which might otherwise be avoided. This confrontation can help to resolve the discrepancy between pre-existing schemas and the information presented by the traumatic event, thus diminishing the frequency and impact of intrusive thoughts. Further analyses using the LIWC text analysis program (Pennebaker, Booth & Francis, 2007), however, revealed several unexpected findings that contradicted those from previous research. Two explanations are possible.

First, a higher use of insight words was associated with greater increases in avoidance over the course of the study. Given that a greater use of cognitive words is assumed to reflect an active search for meaning, one would expect it to be associated with decreased avoidance. It may be that as individuals gain insight into the event and its implications, the reality of their experience becomes fully realised and there is a subsequent need for avoidance mechanisms to counteract the potential distress that may arise with such realisations.

Second, an increased use of causal words from the first to the third writing session was associated with reductions in posttraumatic growth, as assessed using the PTGI-SF, from baseline to 8 week follow-up. Numerous prior studies have found increases in causal words to be predictive of improved health (e.g. Pennebaker, Mayne & Francis, 1997; Petrie et al., 1999) and theoretical assumptions maintain that increased use of causal words reflects narrative construction and integration. However, not all studies have found positive associations between increased causal word use and subsequent health (e.g. Pennebaker, Mayne & Francis, 1997). Batten et al. (2003) reported that increases in causation words were associated with increased physical symptoms and psychological distress in a sample of childhood sexual abuse survivors. Similarly, Owen, Giese-Davis, Cordova, Kronenwetter, Golant and Spiegel (2006) found that among people who use emotional suppression as a way to regulate their emotions, increasing levels of cognitive word use were associated with greater levels of mood disturbance.

This latter finding may shed some light on the unexpected results found in the current study. Owen et al. (2006) suggest that cognitive processing in the context of restricted emotional expression may reflect attempts to intellectualise the experience in order to cope and is therefore insufficient for the resolution of distress. In line with this hypothesis, it is possible that participants in the current study were using the writing sessions to intellectualise or rationalise, rather than emotionally express and process, their experience, which contributed to a decline in posttraumatic growth. Alternatively, it might be that the increased causality language reflects a tendency towards unhelpful causal attributions and resultant emotions of anger, guilt, or shame, which might impede cognitive processing (Joseph, 1999). However, these hypotheses could not be tested in the current context and remain speculative.

Another possibility, and one that has received limited prior attention, relates to the inability of LIWC analyses to distinguish between constructive and unconstructive occurrences of the same word. To illustrate, the word ‘happy’ in the sentence “I am not happy” would be classified as a positive emotion word, even though the statement reflects a negative emotion or mood state. Likewise, the word ‘understand’ in the sentence “I don’t understand why it had to happen to me?” would be classified as an insight word, while the writer is expressing incomprehension and an inability to understand. This complication of using a simple word counting strategy that ignores context may mean that what is presumed to be an increase in causal understanding and insight might actually reflect an increase in the participants’ expressions of incomprehension and lack of understanding. If the latter were true, a negative association between causal word use and posttraumatic growth would make sense, but without a fuller analysis that takes the context of each causal word occurrence into consideration, it is not possible to know. This would be a fruitful line of inquiry for further research.

Other findings from this study merit attention. Firstly, we chose to measure posttraumatic growth using two separate instruments, since previous research has recommended the use of multiple assessment tools (Joseph & Linley, 2008). However, the results of this study revealed differential findings for growth outcomes depending on the measurement tool used, with significant improvements in growth for disclosure participants when assessed using the PWB-PTCQ but not the PTGI-SF. Likewise, the pattern of associations between LIWC dimensions and changes in growth varied depending on the assessment tool used. These findings reiterate the growing recognition within the posttraumatic growth literature that existing measures are not synonymous and each may capture unique elements of the overall phenomenon of positive psychological well-being following trauma and adversity (Joseph & Linley, 2008).

Secondly, the internet-based administration of the expressive writing intervention appeared to be successful in terms of facilitating positive outcomes for disclosure writing participants, providing further support for Sheese et al.'s (2004) recommendation that the internet is a viable platform for conducting the Pennebaker paradigm. However, we are aware of no study to date that has compared the relative effectiveness of internet-based delivery with traditional laboratory-based delivery. As such, it is premature to draw any conclusions about which delivery method is superior.

Methodological limitations constrain the interpretation of findings from this study. Firstly, the study was exploratory in nature and was based on a small sample, with only 24 participants completing all stages of the research. Whilst other studies in this area have also used small samples (e.g. Gebler & Maercker, 2007, $N = 17$; Smyth et al., 2008, $N = 25$), there was insignificant statistical power to detect smaller effects or conduct further analyses of moderating variables. The low uptake and high attrition rate is also of concern. It is possible the internet-based design was not appealing to potential participants and raised their concerns

about the emotional risks of participating. Likewise, the lack of direct contact between experimenter and participants may have made it easier for participants to not take the intervention seriously and withdraw from the study. More generally, it may be the case that the writing element of the study contributed to the low uptake, since extended writing exercises may be unsuitable for many people. Thus, although a large proportion of participants expressed interest in further participation following the baseline assessment - potentially because they wanted to see how the study could help them – they withdrew when they discovered the intervention involved writing.

A further limitation was the pre-existing differences between writing groups at baseline, with expressive writing group participants reporting significantly lower posttraumatic growth than controls pre-writing. The analysis of change scores attempted to overcome this limitation, but it does not eliminate the problem entirely. In particular, it is possible that the expressive writing group had more scope to improve with respect to posttraumatic growth, since they scored lower on the PWB-PTCQ at baseline. Similarly, participants that completed all stages of the study reported significantly greater intrusive thoughts at baseline than non-completers. We therefore cannot rule out the possibility that those that took part in this study were more motivated to obtain improvements in psychological well-being than those that did not.

Despite these limitations, our results indicate that internet-based expressive writing can facilitate posttraumatic growth and contribute to a reduction in intrusive trauma-related cognitions.

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Table I. Manipulation checks for Essay Evaluation Measure scores and LIWC word categories by writing group

Writing feature	Writing Session 1			Writing Session 2			Writing Session 3		
	Expressive	Control	<i>t</i>	Expressive	Control	<i>t</i>	Expressive	Control	<i>t</i>
	<i>M (SD)</i>	<i>M (SD)</i>		<i>M (SD)</i>	<i>M (SD)</i>		<i>M (SD)</i>	<i>M (SD)</i>	
EEM Personal	5.36 (1.08)	2.70 (2.00)	-4.20***	5.36 (1.01)	3.30 (2.16)	-3.13**	5.14 (1.51)	2.60 (1.90)	-3.66**
EEM Meaningful	3.93 (2.09)	1.90 (1.73)	-2.51*	4.00 (2.04)	2.40 (1.84)	-1.97*	4.21 (2.16)	1.70 (2.06)	-2.87**
EEM Emotional	3.50 (1.95)	1.60 (1.58)	-2.54*	4.21 (0.89)	1.90 (1.91)	-3.99***	4.36 (1.60)	1.70 (2.31)	-3.34**
LIWC Positive	2.21 (.91)	1.93 (1.28)	-.631	2.20 (1.16)	1.76 (.80)	-1.02	2.21 (1.31)	1.49 (1.20)	-1.38
LIWC Negative	4.03 (1.90)	1.25 (.94)	-4.71***	4.44 (1.43)	.78 (.72)	-8.26***	3.54 (1.28)	1.13 (.68)	-5.95***
LIWC Insight	3.14 (1.46)	1.42 (.60)	-3.94**	3.90 (1.52)	1.41 (1.63)	-3.84**	3.69 (1.61)	1.51 (1.52)	-3.35**
LIWC Causation	1.58 (.73)	1.07 (.68)	-1.73	1.43 (.80)	1.06 (.71)	-1.19	2.14 (1.17)	1.22 (.53)	-2.58*
Total Words	461 (170)	409 (42)	-1.10	472 (179)	428 (118)	-.67	474 (157)	414 (146)	-.66

Note: EEM = Essay Evaluation Measure; LIWC = Linguistic Inquiry and Word Count. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table II. Means and standard deviations for IES-R, PTGI-SF and PWB-PTCQ as a function of writing group and assessment period

		Control Group (<i>N</i> = 10)			Expressive Group (<i>N</i> = 14)			Overall Sample (<i>N</i> = 24)		
		Baseline	2 Week	8 Week	Baseline	2 Week	8 Week	Baseline	2 Week	8 Week
IES-R Intrusion	<i>M</i>	13.31	10.31	12.38	19.89	17.33	14.79	17.37	14.65	13.91
	<i>SD</i>	10.22	9.39	8.26	7.08	8.46	9.30	8.88	9.35	8.82
IES-R Avoidance	<i>M</i>	10.31	9.00	7.88	15.81	13.86	15.07	13.71	12.00	12.45
	<i>SD</i>	9.05	8.88	6.29	6.57	6.37	6.97	7.96	7.68	7.47
IES-R Hyper-arousal	<i>M</i>	7.77	6.92	7.63	14.14	12.00	10.29	11.71	10.06	9.32
	<i>SD</i>	9.07	8.32	6.63	5.86	6.19	6.41	7.79	7.39	6.47
PTGI-SF	<i>M</i>	17.38	17.38	17.50	13.86	14.71	14.21	15.14	15.68	15.41
	<i>SD</i>	14.36	12.83	14.72	9.42	10.87	10.30	11.26	11.39	11.85
PWB-PTCQ	<i>M</i>	59.75	58.75	58.00	45.71	46.50	51.21	50.82	50.95	53.68
	<i>SD</i>	18.77	19.55	17.21	12.42	13.01	10.46	16.15	16.39	13.22

Note: IES-R = Impact of Event Scale – Revised; PTGI-SF = Posttraumatic Growth Inventory –Short Form; PWB-PTCQ = Psychological Well-Being – Posttraumatic Changes Questionnaire.

Table III. Pearson's correlations between LIWC dimensions and outcome variable change scores

	Δ IES-R Intrusion	Δ IES-R Avoidance	Δ IES-R Hyper-arousal	Δ PTGI-SF	Δ PWB-PTCQ
Mean positive emotion	.15	.30	.29	.09	.04
Mean negative emotion	-.03	.11	-.01	.01	.54**
Differential emotion	-.11	-.05	-.18	-.03	.53*
Mean insight	.14	.45*	.13	.01	.60**
Insight change	-.06	.09	-.24	.33	.34
Mean causal	.15	.29	.30	-.21	.17
Causal change	-.16	-.21	-.26	-.50*	-.27

Note. The outcome measures are change scores (T3 – T1). Thus, increases in IES-R subscales reflect a worsening of symptoms, whilst increases in PTGI-SF and PWB-PTCQ reflect an improvement in posttraumatic growth. The mean positive emotion, negative emotion, insight and causal variables are the mean percentage of each word type used averaged across the three essays. The differential emotion variable is the mean negative emotion score minus the mean positive emotion score, such that positive scores indicate greater use of negative emotion words relative to positive emotion words. The cognitive change variables (insight change, causal change) were calculated by subtracting the first day's writing score from the third day's writing score, with positive scores indicating greater use of insight and causal words on the last day of writing relative to the first. IES-R = Impact of Event Scale – Revised; PTGI-SF = Posttraumatic Growth Inventory – Short Form; PWB-PTCQ = Psychological Well-Being – Post Trauma Changes Questionnaire.

* $p < .05$; ** $p < .01$.